

# (12) UK Patent Application (19) GB (11) 2 306 225 (13) A

(43) Date of A Publication 30.04.1997

(21) Application No 9621078.6

(22) Date of Filing 09.10.1996

(30) Priority Data

(31) 19538144

(32) 13.10.1995

(33) DE

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(51) INT CL<sup>6</sup>

F16D 66/02

(52) UK CL (Edition O )

G1S S8W

(56) Documents Cited

None

(58) Field of Search

UK CL (Edition O ) G1S S8W

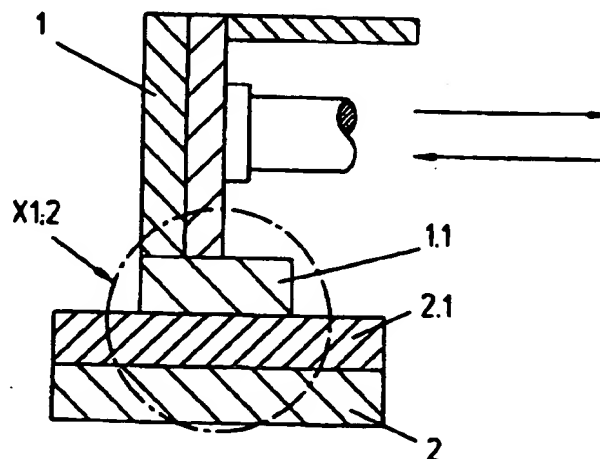
INT CL<sup>6</sup> F16D 66/02

ONLINE DATABASES:WPI,CLAIMS,EDOC,WPII

(54) Machinery with wear parts

(57) Wear parts of machinery have embedded within them optically recognisable elements, exposure of which is an indication of the state of wear. Corresponding wear parts, as well as wearing plates which slide on top of each other each have at least one element for indicating a state of wear. In the non-wearing reverse side of the wearing plates are embedded elements of material of up to the hardness of the wearing plates up to a depth representing the wear limits for safe support of the machinery and as an indicator can be detected optically.

Fig.1



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Fig.1

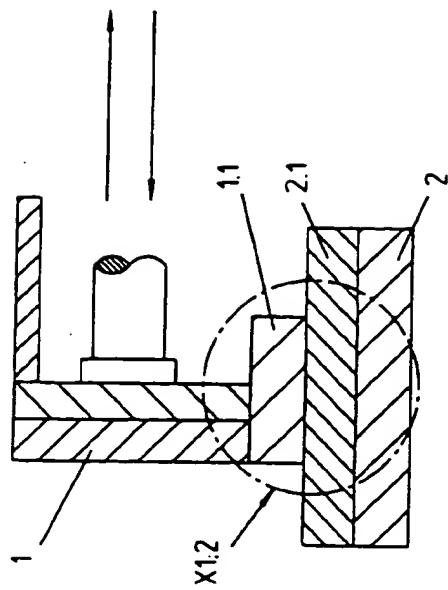


Fig.2

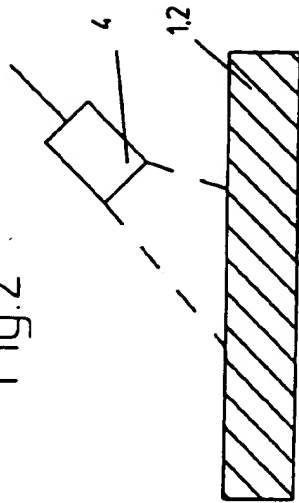
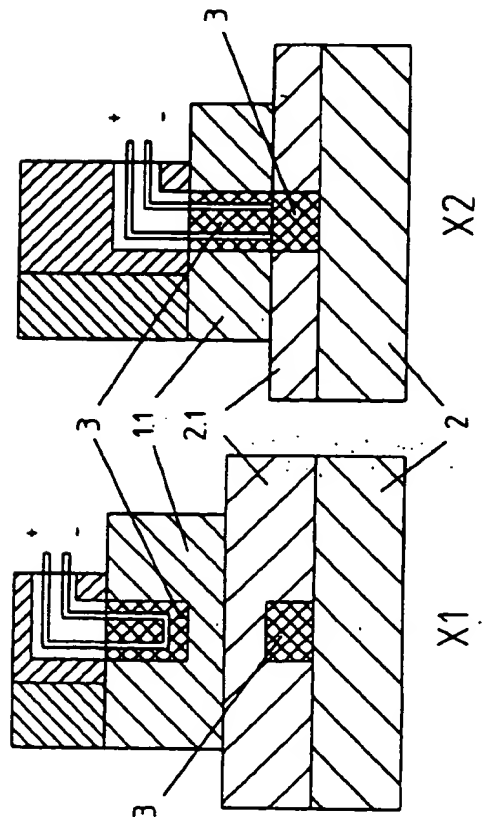
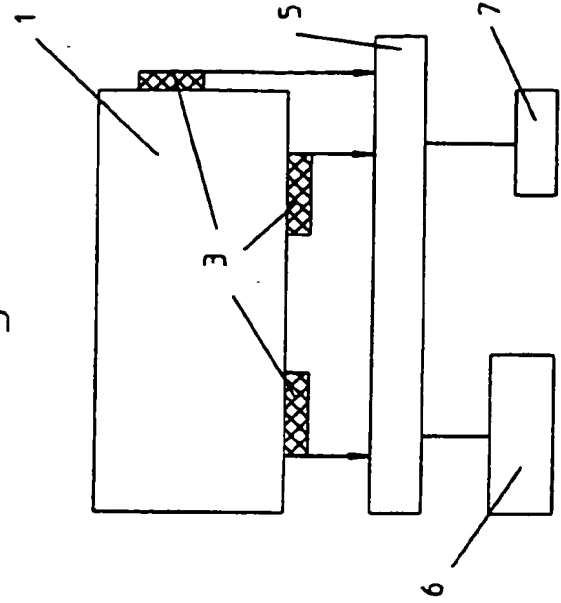


Fig.3

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MACHINERY WITH WEAR PARTS

The invention concerns wearing plates for plant and/or machines for processing scrap metal, bulky refuse or waste, such as scrap metal shears or scrap metal presses, especially corresponding wearing plates on the sliding plate and guide track of scrap metal shears.

Already known are technical measures in the machine or plant diagnosis for detecting and evaluating a state of wear in the operating system.

According to EP-A-O 411 284, from the field of motor vehicle technology it is already known to detect electrically and display by means of contact elements the state of wear of brake linings on reaching a residual layer. Also known from DE-A-26 55 657 is the method of integrating colouring inserts in the friction material for callipers of disc brakes for optically recognising the state of wear and tear. Furthermore, in various different areas of technology it is also known to use infrared or ultrasonic measuring systems for determining the wall thickness measurements.

In plant or machines for processing scrap metal, bulky refuse or waste there exists the special problem of making recognisable the state of wear of the wearing plates or wearing sheet metal which have been embedded exchangeably both for the protection of the basic structure as well as the power transmitting machine parts and to be able to exchange these in good time. As a rule the state of wear and tear of these parts is not recognised in time by the operator of the plant or machine or the state of wear is recognised only when replacement parts are exchanged, depending on the position of the particular worn part.

Thus, for example, in scrap metal shears considerable damage can be incurred to the basic structure and also to the hydraulic system if the wear and tear state of the wearing plates in the sliding plate group of parts is not recognised in time, because as a result of the increased

wear and tear the necessary sliding support of movable machine parts is no longer ensured. As the load of the machine parts is then transferred to the piston of the hydraulic cylinder, the piston rod will bend or break, at the very least the hydraulic cylinder will be subjected to excessive wear.

It is the aim of the invention with technically simple means to determine the state of wear of machine parts of the type mentioned at the beginning and thereby to ensure or prolong the operation or usability of corresponding plant or machinery.

According to the invention this aim is achieved in that

a) corresponding wearing plates as well as wearing plates which slide on top of one another each have at least one element for indicating the state of wear,

b) in the non-wearing reverse side of the wearing plates are embedded the elements of material up to the same hardness as the material of the wearing plates,

c) a defined, maximum admissible state of wear of the wearing plates serves as the measure for the embedding depth of the elements, which at the same time represents the target for the thickness of the remaining residual material of the wearing plates in order to achieve a sufficient support of the position and movement of such machine parts which are not directly connected to the wearing plates, and

d) the target reached for the thickness of the remaining residual material of the wearing plates can be detected at least optically.

Further features of the invention or variants thereof are disclosed in claims 2 to 10.

The invention is explained in the following with the aid of examples. In the accompanying drawings:

Fig. 1 is a partial embodiment of corresponding parts which are subjected to wear on the sliding plate of scrap metal shears,

Fig. 2 is a schematic representation of an embodiment according to the invention for recognising the state of wear with an infrared apparatus; and,

Fig. 3 is a further construction (simplified) of a diagnostic system.

In Fig. 1 in detail X1,2 are shown wearing machine parts of scrap metal shears (not shown). A sliding plate 1 carries out a thrust movement as indicated by the arrows. The thrust plate 1 has as machine part an exchangeable wearing plate 1.1 which slides on a machine part also constructed as a wearing plate 2.1 of a guide track 2 of the scrap metal shears.

As shown in detail X1, elements 3 for indicating the state of wear are provided of which the element 3 embedded in the wearing plate 1.1 represents a weak current electric conductor loop as a contact system and the element 3 situated in the wearing plate 2.1 is inserted plug-like in a drilling in the surface of the wearing plate 2.1 not subjected to wear and has an optically detectable signal colour. On reaching the defined wear state in the wearing plate 1.1 according to detail X2, by breaking the contact a transmittable signal is produced which indicates that the worn wearing plate 1.1 should be replaced. On the side of the guide track 2 the element 3 embedded according to detail X1 shows, optically detectable "from above", the defined state of wearing of the wearing plate 2.1, indicating if this machine part should be exchanged. The latter element 3 can advantageously be constructed for example as a plastic bung having a signal colour and through a drilling can be glued or cast in the remaining non-wearing residual material of the wearing plate 2.1.

The said elements 3 consist of material up to the same hardness as the material of the wearing plates 1.1, 2.1 and are embedded in each case through the non-wearing reverse side of the same. In order to ensure an adequate support of the position and movement of the machine parts which are not directly connected to the wearing plates 1.1, 2.1, A defined maximum admissible state of wear in the wearing plates 1.1, 2.1 thus serves as a measure for the embedding depth of the elements, which at the same time represents the target measurement for the thickness of the remaining residual material of the wearing plates 1.2, 2.1 for achieving adequate support for the position and movement of such machine parts which are not directly connected to the wearing plates 1.2, 2.1.

This solves the problem of scrap metal shears posed at the beginning, in that damage to the basic structure and additionally to the hydraulic system is prevented because the required sliding support of the moving machine parts is sufficiently safeguarded and not endangered through excessive wear and tear.

Added to this is the fact that drive units such as hydraulic cylinders with pistons and piston rods operating in the horizontal direction are substantially freed from a machine part load caused by wearing which then results in bending stress. The wearing plates 1.1, 2.1 according to the invention thus provide a safe method for operating for example scrap metal shears.

According to Fig. 2 the basic idea of the invention shown in simplified form is used for detecting a predetermined state of wear in a wearing machine part, comparable to the wearing plate 1.1, by means of infrared apparatus 4. The machine part 1.1. thus at the same time represents the nonrequired element 3 or a sensor which is not required.

Through the combination, as schematically shown in Fig. 3, it is possible to create an efficient diagnostic system for increasing the availability of plant and

machinery in the field of use described at the beginning when sensors in the sense of the function of the elements 3 according to the invention are fitted to exposed wearing points of machine parts 1, such as wearing plates 1.1, 2.1, 5 of plant and machinery. Through an EDV supported evaluation system 5 the states of wear are made visible on a display device 6 either through analogue or digital means and may even be controlled via a remote interrogation module 7. This device enables a permanent detection of the particular 10 states of wear, in which through sensors which continuously produce signals a warning is given on reaching a certain stage in the progression of wear and tear. The signal transmission can be effected by cable or radio.

CLAIMS

1. Wearing plates for plant and/or machines for processing scrap metal, bulky refuse or waste processing,  
5 such as scrap metal shears or scrap metal presses, characterised in that

a) corresponding wearing plates as well as wearing plates which slide on top of one another each have at least one  
10 element for indicating the state of wear,

b) in the non-wearing reverse side of the wearing plates (1.1, 2.1) are embedded the elements of material up to the same hardness as the material in the wearing plates.  
15

c) a defined, maximum admissible state of wear of the wearing plates serves as the measure for the embedding depth of the elements, which at the same time represents the target for the thickness of the remaining residual  
20 material of the wearing plates for achieving an adequate support of the position and movement of such machine parts which are not directly connected to the wearing plates, and

d) the target reached for the thickness of the remaining residual material of the wearing plates can be detected at least optically.  
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2. Wearing plates according to claim 1, characterised in that the element is embedded plug-like in a drilling of the wearing plates in the surface which is not subjected to wear.  
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3. Wearing plates according to claim 1 or 2, characterised in that compared to the material of the wearing plates the element has an optically detectable signal colour which is distinguishable from the material of the wearing plates.  
35



4. Wearing plates according to claim 1 or 2, characterised in that the element consists of synthetic material.
5. Wearing plates according to claim 1 or 2, characterised in that the element has an electric conductor loop as the electric contact system which on breaking the contact, as a result of wear, produces a transmittable signal.
6. Wearing plates according to claim 1 or 2, 3 and 5, characterised in that in the wearing plate, whose sliding surface in the fitted position represents the lower side view, the element has the electric conductor loop and in the wearing plate, whose sliding surface in the fitted position represents the plan view, the element has the optically detectable signal colour.
7. Use of wearing plates according to claim 1, characterised in that movable machine parts are supported in their operation and drive units acting in the horizontal direction such as hydraulic cylinders with pistons and piston rods are substantially freed from bending stress caused by machine parts load.
8. Wearing plates for plant and/or machines for processing scrap metal, bulky refuse or waste, characterised by the use of beams for detecting the state of wear.
9. Wearing plates according to claim 8, characterised in that infrared apparatus and/or ultrasonic apparatus are used.
10. Wearing plates according to claim 1 to 9, characterised in that the wearing plates are connected to an evaluation apparatus, a display apparatus and/or a remote interrogation module and this combination represents a diagnostic system.

11. Wear monitoring equipment, substantially as described with reference to the accompanying drawings.



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Application No: GB 9621078.6  
Claims searched: 1-7

Examiner: A.J.Rudge  
Date of search: 31 December 1996

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): G1S(SBW)

Int CI (Ed.6): F16D-66/02

Other: ONLINE: WPI, CLAIMS, EDOC, WPIL

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
	None	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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